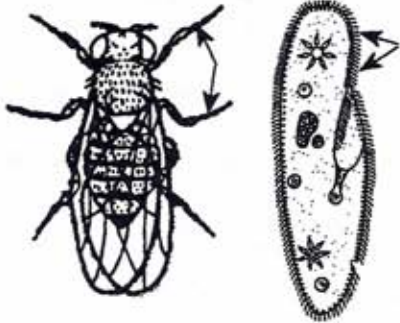


Homework 1

Name _____

- What occurs during the digestion of proteins?
 - Specific enzymes break down proteins into amino acids.
 - Specific hormones break down proteins into simple sugars.
 - Specific hormones break down proteins into complex starches.
 - Specific enzymes break down proteins into simple sugars.

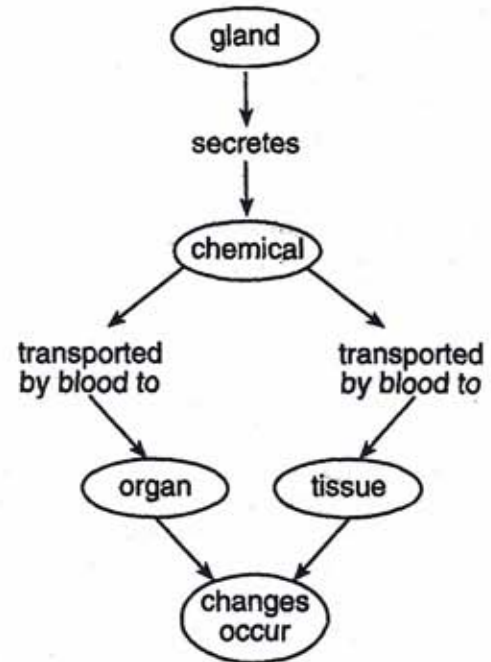
2. Two organisms are shown in the diagrams below.



The arrows in the diagrams indicate structures that help these organisms to

- carry out respiration
 - carry out photosynthesis
 - obtain food
 - excrete wastes
- During a long-distance run on a hot day, an athlete produces large quantities of sweat. As a result, the kidneys change the rate of urine production. Why is this change important?
 - Decreased urine production increases the amino acids in the blood.
 - Increased urine production removes amino acids produced as a result of running.
 - Decreased urine production allows the body to conserve water.
 - Increased urine production allows more water to remain in the bloodstream.
 - All of the cell shapes shown in the diagrams below have the same volume. Which form could absorb nutrients most efficiently and quickly?
 -
 -
 -
 -

5. An important method of communication between cells in an organism is shown in the diagram below.



What is the chemical referred to in the diagram?

- a hormone important in maintaining homeostasis
 - an enzyme detected by a cell membrane receptor
 - DNA necessary for regulating cell functions
 - a food molecule taken in by an organism
- Molecules *A* and *B* come in contact with the cell membrane of the same cell. Molecule *A* passes through the membrane readily, but molecule *B* does not. Which statement could describe molecules *A* and *B*?
 - Molecule *A* is a protein, and molecule *B* is a fat.
 - Molecule *A* is a starch, and molecule *B* is a simple sugar.
 - Molecule *A* is an amino acid, and molecule *B* is a simple sugar.
 - Molecule *A* is a simple sugar, and molecule *B* is a starch.
 - Which statement best describes the relationship between the number of genes and the number of chromosomes in human skin cells?
 - There are more genes than chromosomes in skin cells.
 - There are more chromosomes than genes in skin cells.
 - There are equal numbers of genes and chromosomes in skin cells.

8. A colony of red bacteria is allowed to reproduce for 16 generations. A scientist examines the colony at the end of this time and notes that all the individuals are almost identical in all characteristics. This evidence suggests that the bacteria

- (1) did not receive the proper nutrients
- (2) reproduced sexually
- (3) exchanged genetic material
- (4) reproduced asexually

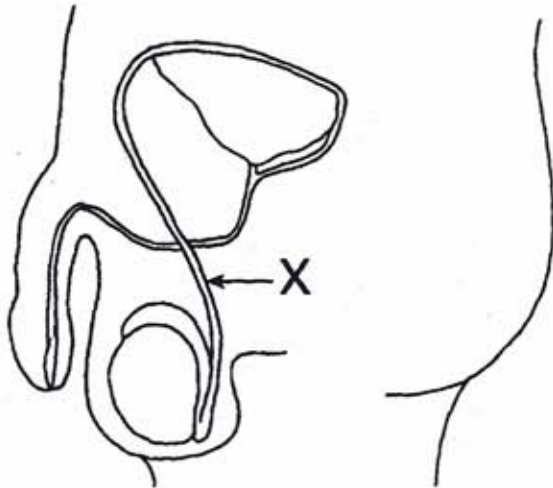
9. A woman has a gene that causes a visual disorder. To prevent the disorder from appearing in future generations, the defective gene would have to be repaired in the mother's

- (1) nervous system
- (2) reproductive cells
- (3) eye
- (4) uterus

10. Which statement best explains the significance of meiosis in the evolution of a species?

- (1) Meiosis produces eggs and sperm that are alike.
- (2) Meiosis provides for chromosomal variation in the gametes produced by an organism.
- (3) Equal numbers of eggs and sperm are produced by meiosis.
- (4) The gametes produced by meiosis ensure the continuation of any particular species by asexual reproduction.

11. The diagram below represents the male reproductive system in humans.



If structure X was cut and tied off at the arrow, which change would occur immediately?

- (1) Hormones would no longer be produced.
- (2) Sperm would no longer be produced.
- (3) Sperm would be produced but no longer released from the body.
- (4) Urine would be produced but no longer released from the bladder.

12. It was once thought that decaying meat turned into maggots (fly larvae). Careful experimentation by scientists demonstrated that maggots actually come from fly eggs and not meat. These experiments illustrate that new individuals result only from

- (1) genetic engineering
- (2) reproduction and development
- (3) nutrition and replication
- (4) metabolic homeostasis

13. Which event occurring in the life cycle of a bacterium most directly involves the replication of DNA?

- (1) The bacterium copies its single chromosome.
- (2) As the cell grows, the two copies of the chromosome separate.
- (3) The cell divides as a partition separates it into equal halves.
- (4) Each new cell receives one copy of the chromosome.

14. What will most likely result if a diabetic injects an overdose of insulin?

- (1) a serious infection in the pancreas
- (2) an increase in the production of pancreatic enzymes
- (3) an accumulation of wastes in the bloodstream
- (4) a dangerous drop in blood sugar levels

15. Cyanide is a poison that limits the ability of an animal cell to manufacture ATP. In a cell containing a small amount of cyanide, which process would be *least* affected?

- (1) movement
- (2) cell division
- (3) active transport
- (4) diffusion

16. One similarity between cell receptors and antibodies is that both

- (1) are produced by nerve cells
- (2) are highly specific in their actions
- (3) slow the rates of chemical reactions
- (4) are involved in digestion

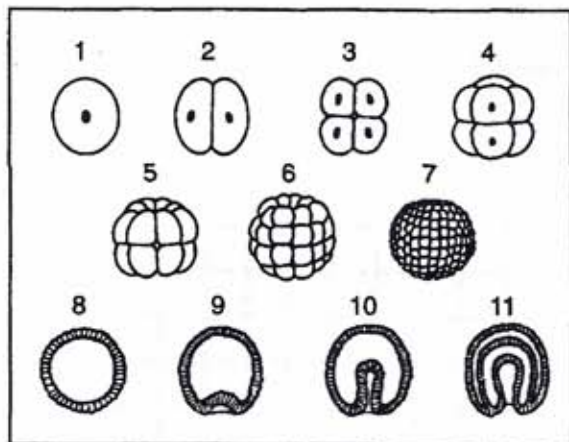
17. Which phrase does not describe a way the human body responds to fight disease?

- (1) destruction of infectious agents by white blood cells
- (2) production of antibodies by white blood cells
- (3) increased production of white blood cells
- (4) production of pathogens by white blood cells

18. A person with AIDS is likely to develop infectious diseases because the virus that causes AIDS

- (1) destroys cancerous cells
- (2) damages the immune system
- (3) increases the rate of antibody production
- (4) increases the rate of microbe destruction

19. Which event does not occur between stages 2 and 11 in the process represented in the diagram below?



- (1) a decrease in cell size
 (2) DNA replication
 (3) the development of embryonic layers
 (4) fertilization
20. The table below shows the rate of water loss in three different plants.

Plant	Liters of Water Lost Per Day
Cactus	0.02
Potato plant	1.00
Apple tree	19.00

- One reason each plant loses a different amount of water is that each has
- (1) different guard cells adapted to maintain homeostasis
 (2) different types of insulin-secreting cells that regulate water levels
 (3) the same number of chloroplasts but different rates of photosynthesis
 (4) the same rate of photosynthesis but different numbers of chloroplasts
21. A biologist in a laboratory reports a new discovery based on experimental results. If the experimental results are valid, biologists in other laboratories should be able to
- (1) repeat the same experiment with a different variable and obtain the same results
 (2) perform the same experiment and obtain different results
 (3) repeat the same experiment and obtain the same results
 (4) perform the same experiment under different experimental conditions and obtain the same results

22. Two test tubes were filled with a solution of bromthymol blue. A student exhaled through a straw into each tube, and the bromthymol blue turned yellow. An aquatic green plant was placed into each tube, and the tubes were corked. One tube was placed in the dark, and one was placed in direct sunlight. The yellow solution in the tube in sunlight turned blue, while the one in the dark remained yellow. Which statement best explains why the solution in the tube placed in sunlight returned to a blue color?
- (1) Oxygen was produced by photosynthesis.
 (2) Oxygen was removed by respiration.
 (3) Carbon dioxide was removed by photosynthesis.
 (4) Carbon dioxide was produced by respiration.
23. A small piece of black paper was folded in half and used to cover part of the top and bottom portions of a leaf on a living geranium plant. After the plant was kept in sunlight for several days, the paper was removed. The leaf was then boiled in alcohol to remove the chlorophyll and placed in Lugol's iodine solution, which turns blue-black in the presence of starch. Only the part of the leaf that had not been covered turned blue-black. This investigation was most likely testing the hypothesis that
- (1) light is necessary for photosynthesis to occur
 (2) alcohol plus chlorophyll forms Lugol's iodine solution
 (3) green plants use carbon dioxide in photosynthesis
 (4) plants use alcohol in the production of chlorophyll
24. To locate a specimen on a prepared slide with a compound microscope, a student should begin with the low-power objective rather than the high-power objective because the
- (1) field of vision is smaller under low power than under high power
 (2) field of vision is smaller under low power than under high power
 (3) specimen does not need to be stained for observation under low power but must be stained for observation under high power
 (4) portion of the specimen that can be observed under low power is less than the portion that can be observed under high power
25. Substance *X* has a unique characteristic in that it fluoresces (glows) when exposed to ultraviolet light. An investigator added substance *X* to a dish containing a culture of cells. The investigator exposed the cells to ultraviolet light and found that substance *X* was highly concentrated only within mitochondria (cell organelles). Which assumption could the investigator make regarding the results of this experiment?
- (1) Substance *X* could be used to identify mitochondria in living cells.
 (2) Substance *X* could be used to stain nuclei of living cells.
 (3) All fluorescent substances will be absorbed by mitochondria.
 (4) All mitochondria synthesize fluorescent substances.

Base your answers to questions 26 through 31 on the information below and on your knowledge of biology.

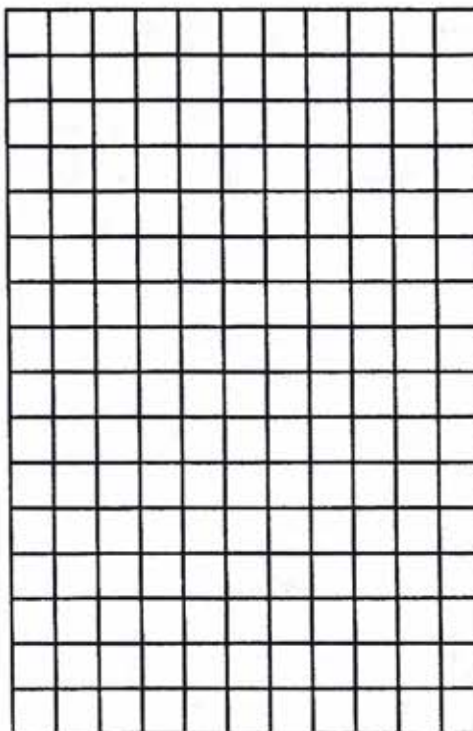
A student performed a laboratory investigation to determine the effect of temperature on the heart rate of *Daphnia* (water flea). The following temperatures and heart rates were recorded:

20°C - 260 beats/min; 10°C - 152 beats/min;
25°C - 300 beats/min; 5°C - 108 beats/min;
15°C - 200 beats/min

Data Table

Temperature (°C)	Heart Rate (beats/min)

Heart Rate (beats/min)



Temperature (°C)

26. Organize the data by filling in the data table provided above. Complete both columns in the data table so that the temperature either increases or decreases from the top to the bottom of the table. The data table below is provided for practice purposes only.
27. Mark an appropriate scale on the axis labeled "Temperature (°C)."
28. Mark an appropriate scale on the axis labeled "Heart Rate (beats/min)."
29. Plot the data from your data table. Surround each point with a small circle and connect the points.
30. During which temperature interval did the greatest change in heart rate occur?
(1) 5 - 10°C (2) 10-15°C (3) 15-20°C (4) 20-25°C
31. Using one or more complete sentences, state a valid conclusion that relates increasing temperature to heart rate in *Daphnia*.
- _____
32. Using a specific example, illustrate how a feedback mechanism maintains homeostasis in a living organism.

Base your answers to questions 33 through 36 on the passage below and on your knowledge of biology.

The Mystery of Deformed Frogs

Deformities, such as legs protruding from stomachs, no legs at all, eyes on backs, and suction cup fingers growing from sides, are turning up with alarming frequency in North American frogs. Clusters of deformed frogs have been found in California, Oregon, Colorado, Idaho, Mississippi, Montana, Ohio, Vermont, and Quebec.

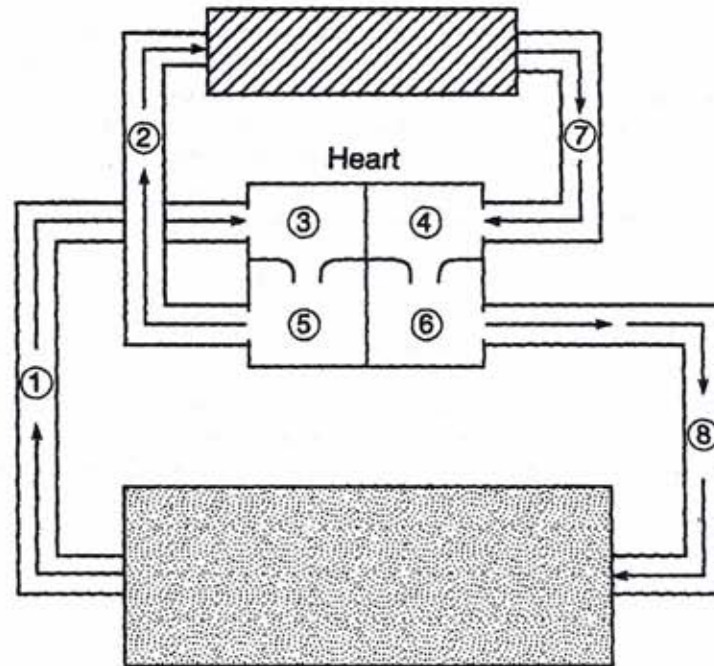
Scientists in Montreal have been studying frogs in more than 100 ponds in the St. Lawrence River Valley for the past 4 years. Normally, less than 1% of frogs are deformed, but in ponds where pesticides are used on surrounding land, as many as 69% of the frogs were deformed. A molecular biologist from the University of California believes that the deformities may be linked to a new generation of chemicals that mimic growth hormones. The same kind of deformities found in the ponds have been replicated in laboratory experiments.

Some scientists have associated the deformities with a by-product of retinoid, which is found in acne medication and skin rejuvenation creams. Retinoids inside a growing animal can cause deformities. For this reason, pregnant women are warned not to use skin medicines that contain retinoids. Recent laboratory experiments have determined that a pesticide can mimic a retinoid.

A developmental biologist from Hartwick College in Oneonta, New York, questioned whether a chemical could be the culprit because there were no deformed fish or other animals found in the ponds where the deformed frogs were captured. He believes parasites are the cause. When examining a three-legged frog from Vermont, the biologist found tiny parasitic flatworms packed into the joint where a leg was missing. In a laboratory experiment, he demonstrated that the invasion of parasites in a tadpole caused the tadpole to sprout an extra leg as it developed. Scientists in Oregon have made similar observations.

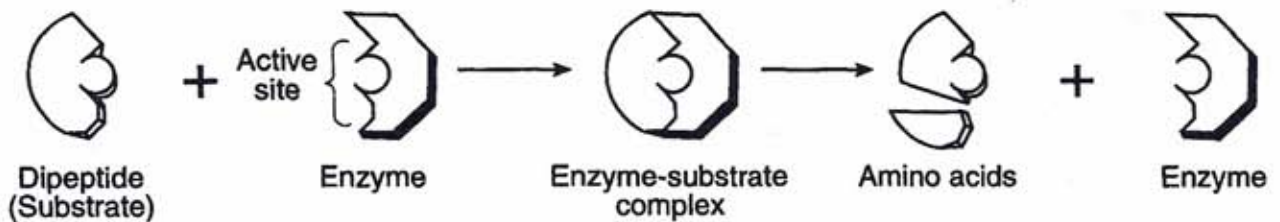
33. Why are pregnant women advised not to use skin medicines containing retinoids?
- (1) Retinoid by-products may cause fetal deformities.
 - (2) Retinoid by-products cause parasites to invade developing frogs.
 - (3) Retinoid by-products mimic the effects of pesticides on fetal tissue.
 - (4) Retinoid by-products reduce abnormalities in maternal tissue.
34. Some scientists argue that pesticides may *not* be the cause of the frog deformities because
- (1) pesticide use has decreased over the last 4 years
 - (2) new pesticides are used in skin-care products
 - (3) other animals in the ponds containing deformed frogs did not have abnormalities
 - (4) laboratory experiments have determined that a pesticide can mimic retinoids
35. A possible reason for the absence of deformed fish in the ponds that contained deformed frogs is that
- (1) fish can swim away from chemicals introduced into the pond
 - (2) parasites that affect frogs usually do not affect fish
 - (3) fish cannot develop deformities
 - (4) frogs and fish are not found in the same habitat
36. Which inference can be made from the information in the passage?
- (1) Only a few isolated incidents of frog deformities have been observed.
 - (2) If frog parasites are controlled, all frog deformities will stop.
 - (3) Deformities in frogs are of little significance.
 - (4) Factors that affect frogs may also affect other organisms.
-

Base your answers to questions 37 through 39 on the diagram below, which represents the pathway of blood throughout the body, and on your knowledge of biology.



37. Which structure carries oxygenated blood to the body?
 (1) 1 (2) 2 (3) 7 (4) 8
38. Which structure represents the chamber of the heart that receives oxygenated blood directly from the lungs?
 (1) 5 (2) 6 (3) 3 (4) 4
39. Using one or more complete sentences, state one specific change that occurs in the gas composition of the blood as the blood moves from structure 6 to structure 3. Specify whether the change is an increase or a decrease in composition.

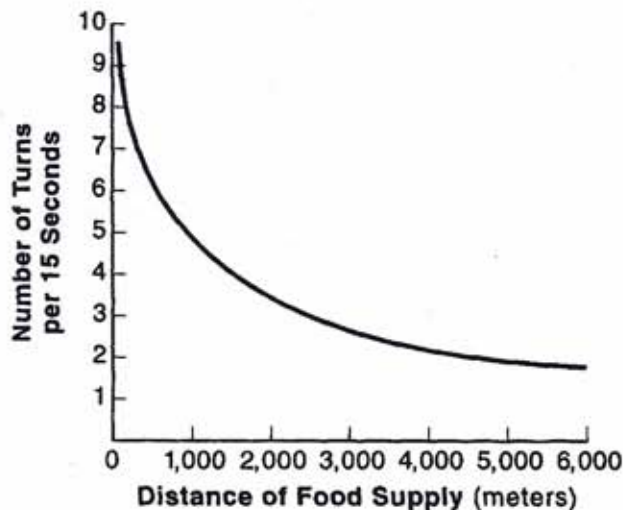
40. A process that occurs in the human body is shown in the diagram below.



What would happen if a temperature change caused the shape of the active site to be altered?

- (1) The dipeptide would digest faster. (3) The amino acids would combine faster.
 (2) The dipeptide would digest slower or not at all. (4) The amino acids would combine slower or not at all.

41. Worker bees acting as scouts are able to communicate the distance of a food supply from the hive by performing a "waggle dance." The graph below shows the relationship between the distance of a food supply from the hive and the number of turns in the waggle dance every 15 seconds.



Using one or more complete sentences, state the relationship between the distance of the food supply from the hive and the number of turns the bee performs in the waggle dance every 15 seconds.

Base your answers to questions 42 and 43 on the investigation described below and on your knowledge of biology.

As part of an investigation, 10 bean seedlings in one setup were grown in the dark, while 10 seedlings in another setup were grown in sunlight. All other growth conditions were kept the same in both setups. The seedlings grown in the dark were white with long, slender stems. These seedlings soon died. The seedlings grown in the sunlight were green and healthy.

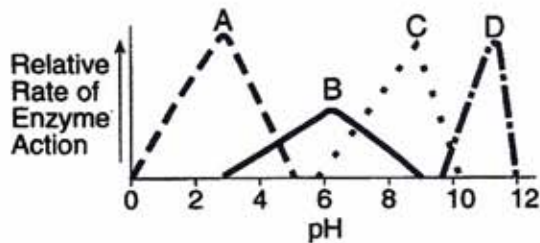
42. Which hypothesis was most likely being tested in this investigation?
- (1) Plants grown in the dark cannot perform the process of respiration.
 - (2) Sunlight is necessary for the normal growth of bean plants.
 - (3) Light is necessary for the germination of bean seeds.
 - (4) Light is necessary for proper mineral absorption by plants.

43. Identify the independent variable in this investigation.

44. An investigation was designed to determine the effect of ultraviolet light on mold spore growth. Two groups of mold spores were grown under identical conditions, except one group was exposed only to ultraviolet light, while the other group was grown in total darkness. In this investigation, the group of mold spores grown without receiving any ultraviolet light is known as the
- (1) control
 - (2) hypothesis
 - (3) dependent variable
 - (4) limiting factor

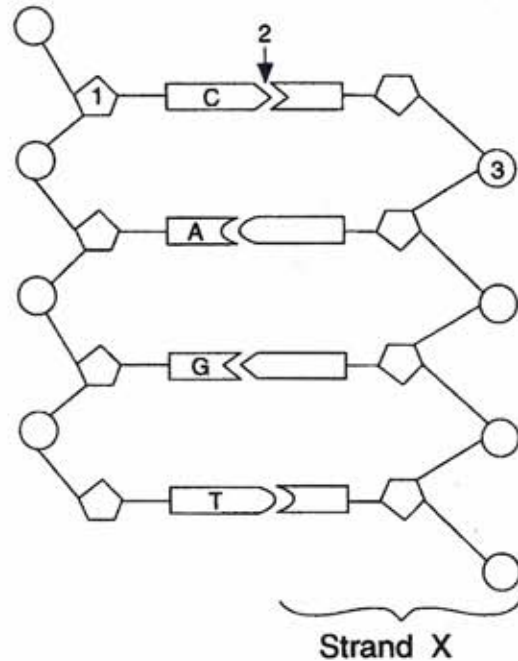
45. Male reproductive cells from numerous lubber grasshoppers, lake trout, and field mice were examined and found to have flagella. A valid conclusion that can be made based on this observation is that
- (1) only lubber grasshoppers, lake trout, and field mice produce reproductive cells with flagella
 - (2) all organisms produce male reproductive cells with flagella
 - (3) only male organisms produce reproductive cells with flagella
 - (4) all male lubber grasshoppers, lake trout, and field mice produce reproductive cells with flagella

Base your answers to questions 46 through 48 on the graph below and on your knowledge of biology. The graph shows the relative rates of action of four enzymes, *A*, *B*, *C*, and *D*.



- Which enzyme shows the greatest change in its rate of action with the *least* change in pH?
46. with the *least* change in pH?
- (1) *A* (2) *B* (3) *C* (4) *D*
47. A solution with a pH of 6 contains enzyme *C* and its substrate. If a base is gradually added to this solution, the rate of action of enzyme *C* would most likely
- (1) remain constant (2) increase, then decrease (3) decrease, then increase (4) decrease constantly
48. Which two enzymes would function in a region of the human body having a neutral pH?
- (1) *A* and *B* (2) *B* and *C* (3) *C* and *D* (4) *B* and *D*
-

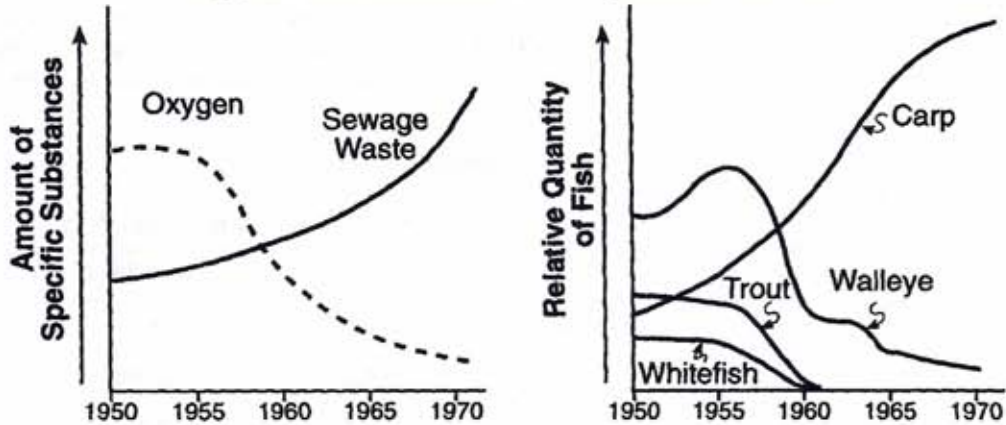
Base your answers to questions 49 and 50 on the diagram below of a DNA molecule and on your knowledge of biology.



- What is the base sequence of strand *X*?
49. (1) G-T-A-C (2) T-G-C-A (3) G-T-C-A (4) A-T-C-G
50. What occurs in the process of replication?
- (1) Structure 1 is hydrolyzed.
 (2) Chemical bonds are broken in region 2.
 (3) Structure 3 is synthesized.
 (4) Proteins are formed in region 2.
-

51. Which relationship can correctly be inferred from the data presented in the graphs below?

Oxygen Content and Fish Population in a Lake



- (1) As sewage waste increases, oxygen content decreases. (3) As oxygen content decreases, carp population decreases.
(2) As sewage waste increases, oxygen content increases. (4) As oxygen content decreases, trout population increases.

Base your answers to questions 52 through 54 on the information below and on your knowledge of biology. Use one or more complete sentences to answer each question.

When a drug manufacturer develops a new drug to treat some form of disease, the drug should be tested to ensure that it does what it is supposed to do. Usually, the drug is tested on animals and, if these tests are successful, it is then tested on humans.

A drug called Lowervil was developed by a drug company to lower blood pressure. Lowervil has been tested successfully on animals, and the drug company is now ready to test it on humans. The drug company claims that one dose of Lowervil per day will decrease blood pressure in individuals experiencing high blood pressure.

A researcher has been hired to determine whether or not Lowervil lowers blood pressure. Answer the following questions related to the experimental testing of the new drug Lowervil.

52. How should the experimental group and control group be treated differently?
53. Why would it be important to use a large number of people in this experiment?
54. How could the researcher determine if the drug is effective in reducing blood pressure?

Base your answers to questions 55 through 57 on the information and data tables below and on your knowledge of biology. Use one or more complete sentences to answer each question.

Drinking alcohol during pregnancy can cause the class of birth defect known as fetal alcohol syndrome (FAS). Scientists do not yet understand the process by which alcohol causes damage to the fetus. There is evidence, however, that the more a pregnant woman drinks, the greater the chances that the child will be affected and the birth defects will be serious. Some evidence indicates that even low levels of alcohol consumption can cause intellectual and behavioral problems.

Infant Characteristics

Characteristics (Average)	Alcohol Use During Pregnancy	
	Drinker	Nondrinker
Weeks of development before birth	36.9	38.7
Birth weight (g)	2,555	3,094
Birth length (cm)	46.8	50.1
Head circumference (cm)	32.1	34.5

Physical Abnormalities Detected in Infants at Birth

Physical Abnormalities	Alcohol Use During Pregnancy	
	Drinker (Percentage of 40 Infants)	Nondrinker (Percentage of 80 Infants)
Low birth weight	73	12
Small brain	33	0
Flattened nasal bridge	8	0
Abnormal facial features	15	0
Spinal defects	8	0
Heart defects	8	0

55. Do the data in the tables justify scientists' conclusions that alcohol causes physical abnormalities at birth by interfering with the normal development of the fetus?
Defend your position with supporting data.
56. What additional data would be needed to better support the scientists' conclusions?
57. Explain why alcohol consumption by the mother is especially harmful during the early stages of pregnancy.